Formulation of a Multiple-Purpose Plan for the Truckee River, Nevada

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Truckee River, Nevada
Plan Formulation Approach

3 Separable Reaches:

- Downtown – FDR Only

  Traditional Benefit-Cost Analysis
- Meadows – Combined FDR + ER

  Trade-off Analysis
- Downstream – ER Only

  Incremental Cost Analysis

Downtown Reno Reach

Benefit-Cost Analysis

Alternative	Total First Cost ($1000)	Annualized First Costs ($1000)	Annual Benefits ($1000)	Net Benefits ($1000)
1	45,975	3,225	1,376	-1849
2	69,340	4,650	1,376	-3274
3	56,560	3,925	1,376	-2549
4	57,350	3,975	1,376	-2599
5	63,290	4,385	1,376	-3009
6	13,167	871	1,180	309
7	1,200	86	52	-34

Truckee Meadows Reach

Benefits & Costs
(Average Annual)

Alternative	ER Output AAHU	NED Benefits $1000	Total Costs $1000
Alt 1 – Low	365	34,070	20,064
Alt 2 – Low	445	31,830	22,918
Alt 3 – Low	739	38,430	20,955
Alt 1 – High	2032	34,070	22,355
Alt 2 – High	2119	31,830	23,246
Alt 3 – High	1787	38,430	21,312
Alt 1 – Max	2570	34,070	43,180
Alt 2 – Max	2659	31,830	43,218
Alt 3 – Max	2125	38,430	40,004

Plan Selection

Criteria:

Maximize total non-monetary and monetary benefits over total costs

Two Methods:

- Trade-off Analysis (EC 1105-2-404)
- Incremental Cost Analysis

Truckee Meadows Reach

Cost Effectiveness Screening
Benefits vs. Total Costs

Alternative	ER Output AAHU	NED Benefits $1000	Total Costs $1000	Cost- Effective?
Alt 1 – Low	365	34,070	20,064	Yes
Alt 3 – Low	739	38,430	20,955	Yes
Alt 3 – High	1787	38,430	21,312	Yes
Alt 1 – High	2032	34,070	22,355	Yes
Alt 2 – Low	445	31,830	22,918	No
Alt 2 – High	2119	31,830	23,246	Yes
Alt 3 – Max	2125	38,430	40,004	Yes
Alt 1 – Max	2570	34,070	43,180	Yes
Alt 2 – Max	2659	31,830	43,218	Yes

Trade-off Analysis

Alternatives	Ecosystem Restoration Benefits	Flood Damage Reduction Benefits	Total Annual Cost	Weighted Product	Ranking
Preferences	0.35	0.31	0.34		
1- Low [Actual] **Normalized**	[365] 0.137	[$34070] 0.886	[$20064] -0.464	0.160	8
3 – Low	0.278	[$38430] 1.000	-0.485	0.236	7
3 – High	0.672	1.000	-0.493	**0.372**	**1**
1 - High	0.764	0.886	-0.517	0.361	2
2 – High	0.797	0.828	-0.538	0.347	3
3 – Max	0.799	1.000	-0.926	0.267	4
1 – Max	0.967	0.886	-0.999	0.266	5
2 - Max	[2659] 1.000	0.828	[$43218] -1.000	0.259	6

Rational Preferences

$$\frac{\text{Preference for FDR Benefit}}{\text{Preference for Total Cost}} = \frac{\text{Maximum FDR Benefit}}{\text{Maximum Total Cost}}$$

$$\frac{\mathbf{0.31}}{\mathbf{0.34}} = \frac{\mathbf{\$\ 38430}}{\mathbf{\$\ 43218}}$$

Truckee Meadows Reach
Trade-off Analysis
Sensitivity Analysis

Preference Assignments			Highest Ranked Alternative	Implied Value of AAHU ($1,000)
ER	FDR	Costs		
0.10	0.42	0.48	Alt 3 High	3.4
0.20	0.38	0.42	Alt 3 High	7.7
0.30	0.33	0.37	Alt 3 High	13.2
0.35	**0.31**	**0.34**	Alt 3 High	16.5
0.40	0.28	0.32	Alt 3 High	20.5
0.50	0.24	0.26	Alt 1 High	30.7
0.60	0.19	0.21	Alt 2 Max	46.1
0.70	0.14	0.16	Alt 2 Max	71.6
0.80	0.09	0.11	Alt 2 Max	122.8
0.90	0.05	0.05	Alt 2 Max	276.4

Incremental Cost Analysis for Combined Plans

- Not endorsed by Corps guidance
- Similar to Incremental Cost Analysis for ecosystem restoration
- Uses “net costs” to allow monetary and non-monetary benefits to be merged for Cost Effectiveness and Incremental Cost Analysis

“Net Costs”

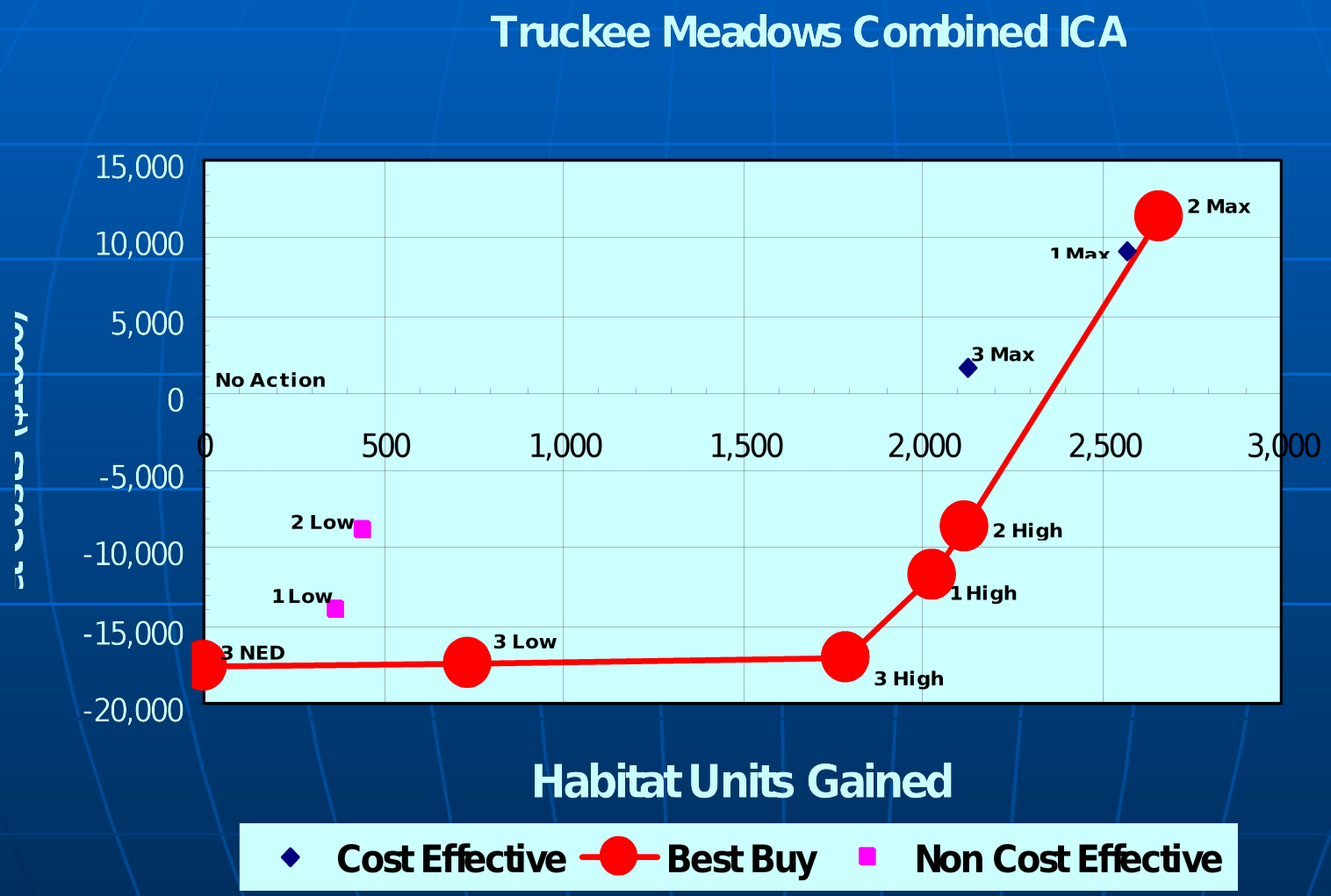
= TOTAL PROJECT COSTS – FDR BENEFITS

Truckee Meadows Reach

Cost Effectiveness Screening
Restoration Benefits vs. Net Costs

Alternative	ER Output AAHU	NED Benefits $1000	Total Costs $1000	Net Costs $1000	Cost-Effective? (Net Costs)
Alt 3 NED	0	38,430	20,752	-17,678	Yes
Alt 3 Low	739	38,430	20,955	-17,475	Yes
Alt 3 High	1787	38,430	21,312	-17,118	Yes
Alt 1 Low	365	34,070	20,064	-14,006	No
Alt 1 High	2032	34,070	22,355	-11,715	Yes
Alt 2 Low	445	31,830	22,918	-8,912	No
Alt 2 High	2119	31,830	23,246	-8,584	Yes
Alt 3 Max	2125	38,430	40,004	1,574	Yes
Alt 1 Max	2570	34,070	43,180	9,110	Yes
Alt 2 Max	2659	31,830	43,218	11,388	Yes

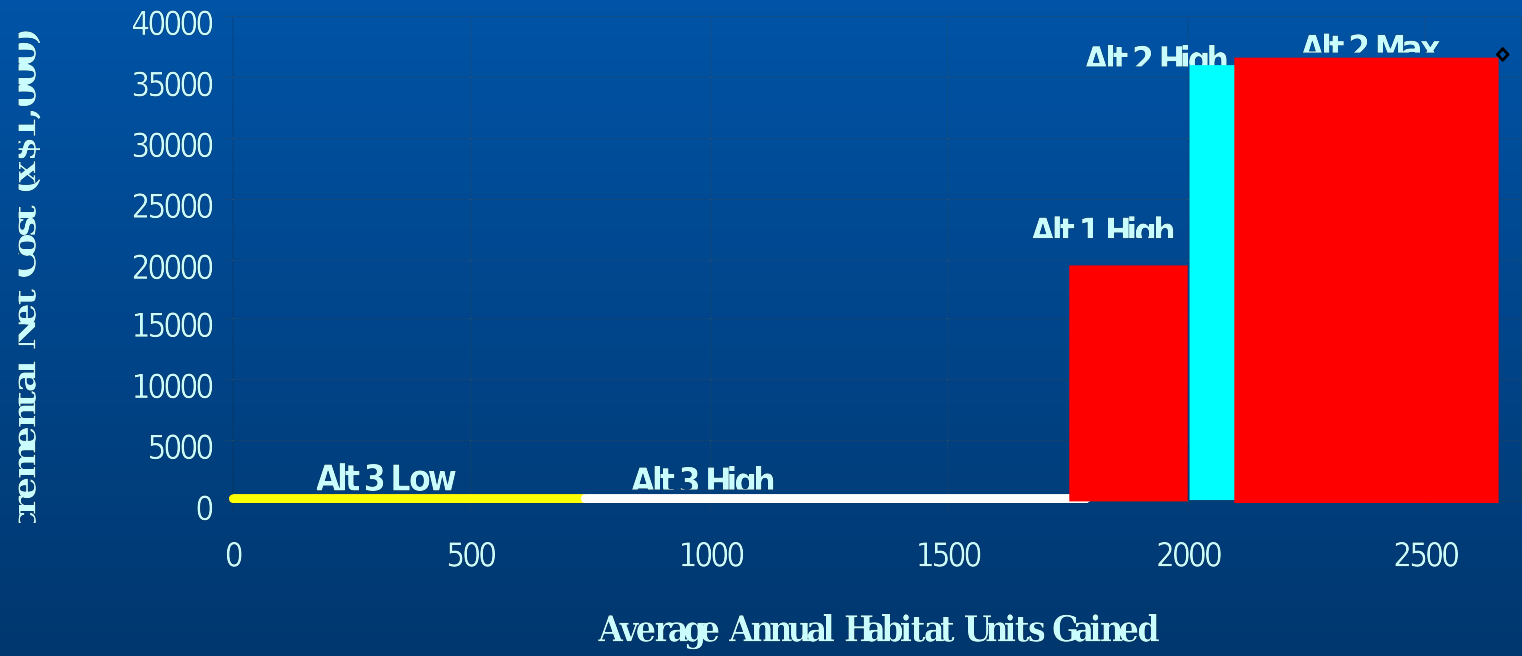
Cost Effectiveness Analysis



Truckee Meadows Reach

Incremental Cost Analysis

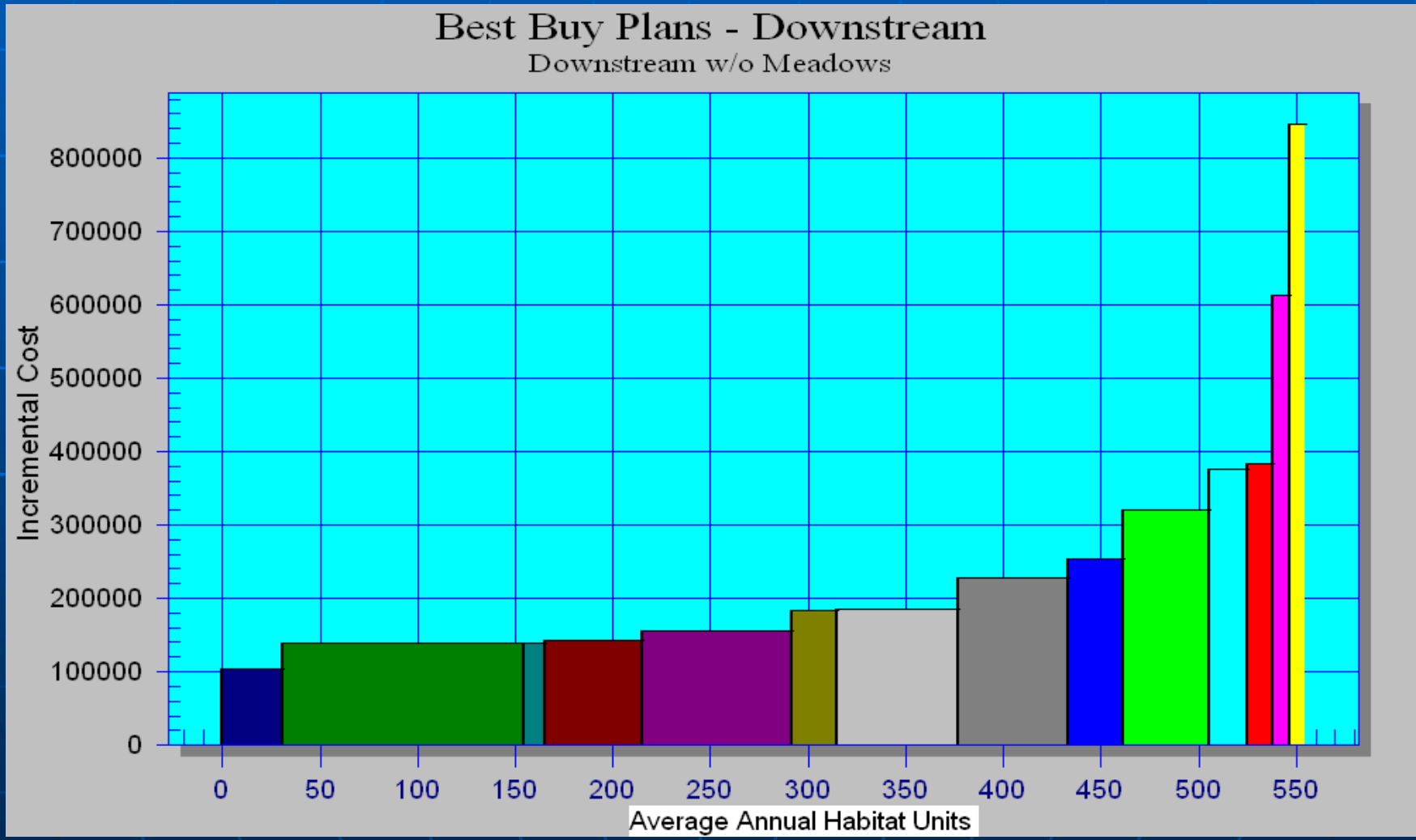
Best Buy Plans



Truckee River, Nevada
Downstream Reaches
Incremental Cost Analysis

- 11 Downstream Reaches
- 4 Scales of ecosystem restoration in most reaches:
  - No Action
  - Low – Medium - High
- 2,359,296 Plans generated by IWR Plan
- 172 Cost-effective plans
- 15 Best Buy plans

Truckee River, Nevada
Downstream Reaches
Incremental Cost Analysis



Truckee River, Nevada

- Maximum incremental cost per habitat unit in the Meadows reach:

  $36,982

- Minimum incremental cost per habitat unit in the Downstream reach:

  $104,704